

CHAPTER 24

UNIT AND VEHICLES USED TO TRANSPORT BULK PETROLEUM

Section I. Tank and Pump Unit

DESCRIPTION

The tank and pump unit as shown in Figures 24-1, page 24-4 and 24-2, page 24-4, consists of a 50-GPM pumping assembly, two 600-gallon aluminum tanks, and related equipment. One electric model and several gasoline models of the tank and pump unit are currently in use. However, the gasoline pump is being replaced by the electric pump when requisitioned. The unit is designed to be transported on the 5-ton, 6X6, cargo truck. It is necessary to transport the tank and pump unit on the 5-ton cargo truck because when the unit is filled with fuel it exceeds the load limits of the 2½-ton cargo truck. The tank and pump unit can be used to refuel aircraft because the filter/separator complies with Military Specification MIL-F-8901E. A newer model tank and pump unit as shown in Figure 24-3, page 24-5, consists of tank control levers at the rear of the unit, a bottom loading port, 500-gallon fuel tanks, and a bottom loading valve that opens automatically when fuel pressure is applied and is closed automatically by the jet level sensor when the tank is full (when filled through bottom loading port). A general description of the components and installation procedures follows.

Pump Unit

The 50-GPM pumping assembly is used to issue bulk petroleum. The pumping assembly as shown in Figure 24-4, page 24-6 includes a pump and engine assembly, a filter/separator, a manifold, hose reels, a ground reel, hose and fittings, and related equipment.

- **Electric motor.** The electric motor is powered by the vehicle electrical system. Electrical connection is provided by an intervehicle power cable attached to the NATO slave receptacle of the vehicle on one end and the electric motor on the other. The electric motor is controlled by an ON-OFF toggle switch or an ON-OFF cable assembly connected to the junction box.
- **Gasoline engine.** The gasoline engine is a one-cylinder, four-cycle, air-cooled, hand-cranked engine. A radio-shielded magneto supplies the ignition spark. A governor controls the engine speed by varying the throttle opening to suit the pump load. The engine has a 1-gallon fuel tank.
- **Pump.** The pump is a 50-GPM, self-priming, centrifugal pump. On the gasoline engine model tank and pump unit, the engine is connected to the pump by an intermediate coupler and the impeller is screwed on the extension of the engine crankshaft. On the electric motor model, the impeller is mounted on the extended shaft of the electric motor. On all models, the pump and engine or motor are mounted on a common base plate to aid removal and use in other pumping operations.
- **Filter/separator.** The filter/separator is a vertical, 50-GPM unit that is designed for a maximum operating pressure of 25 PSI. It has four filter elements and canister assemblies, two pressure gages, a sight glass, and two drains.
- **Manifold.** The manifold controls the flow of product to the suction side of the pump. Two cam-locking couplers provide connections or inlets for the tank suction lines. The product flows from either or both tanks to the suction side of the pump through the manifold outlet and a section of hose. Some models are equipped with a discharge hose running from the filter/separator to the manifold. This permits discharging from the manifold outlet when the three-way valve is positioned to close off the suction side. Other models use the manifold for suction only, and the three-way valve opens or closes the front and rear inlets on the manifold.

- **Hose reels.** The dispensing hoses are stored on two reels, each with a recoil tension spring. A 40-foot length of 1½-inch, noncollapsible discharge hose is used on each reel. Product from the filter/separator enters through a pipe at the hub of the reel and is discharged through the hose.
- **Ground reel.** A ground reel is attached to the frame of the pumping assembly so that the tank and pump unit can be grounded. One section of the ground wire must be clipped to a ground rod near the tank and pump unit before the other section is connected to the vehicle being refueled.
- **Metering kit.** The metering kit (NSN 4930-01-108-9568) consists of a meter, a hose assembly, couplers, cap screws, and washers. The meter is a volumetric, positive displacement meter. It has a five-digit reset counter and a nonsetback totalizer that registers 9,999,999 gallons. The metering kit can be used with all tank and pump units.

Related Items of Equipment

Other items issued with the pumping assembly are a drum suction stub for emptying 55-gallon drums, two dispensing nozzles, a starter rope, a carbon dioxide fire extinguisher, and tie-down assemblies as shown in Figure 24-1, page 24-4. Nozzles must be fixed so that they must be held open by hand. All nozzles must be tended at all times.

The 600-Gallon Tanks

Two welded aluminum, skid-mounted tanks come with the tank and pump unit. The shell of each tank has a manhole assembly, a pump port drain plug, and a discharge valve assembly. Controls for the discharge valve are on top of the tank. The discharge valve outlet is at the bottom rear of the tank, and the drain plug is at the bottom front. A baffle inside the shell reduces the surge of product during transport. Two lifting rings are attached to the top of each end of the shell to make handling easier. Tie-downs are provided for securing the tanks in the vehicle bed.

USE

The tank and pump unit can be used to fill and empty 5-gallon cans, 55-gallon drums, and 500-gallon collapsible drums. It can be used to temporarily store product, refuel ground vehicles, and replace or supplement special-purpose vehicles. The unit may also be used to fuel aircraft if no other aircraft refueling equipment is available.

INSTALLATION

The tank and pump unit is designed to be transported in standard 5-ton cargo trucks. Blocking frames are not necessary for stabilizing the unit in the truck bed. Wood blocking presents a fire hazard because the material is combustible and will absorb fuel. To install the tank and pump unit on a cargo truck, do as follows:

- Lower the tailgate of the truck and remove the tarpaulin, bows, racks, and seats.
- Install the tank and pump unit.

NOTE: The NO SMOKING WITHIN 50 FEET signs painted on the sides of the 600-gallon tanks must not be obstructed.

- Released the ratchet of the tank tie-down assembly by pressing the release in the ratchet handle. Hold the release, pull the handle down until the side cams engage, and push the static ratchet locks up from the ratchet dogs. This allows the center ratchet spool to rotate in either direction. To aid in unrolling the nylon strap, turn the ratchet hook opening down on a flat surface. Press down in the center of the ratchet while pulling the strap away from the ratchet.
- Place the tie-down straps over the tank ends. Attach the brackets to the sides of the truck, and attach the strap end and ratchet to them.
- Move the ratchet handle up and down until the strap is tight. Push the ratchet handle to the LOCK position.

- Hook the loose bracket of the pump tie-down assembly over the top of the reel frame (the long side with the hole out and down). Hook the bracket attached to the strap end beneath the rear of the truck 8 to 10 inches right of center.
- Insert the strap end, rear to front, through the slot in the center of the ratchet spool. Pull the slack through the ratchet spool.
- Unlock the ratchet. Move the ratchet handle up and down until the strap is tight. Push the ratchet handle to its locked position.
- Raise the tailgate.

OPERATION

The tank and pump unit is used to dispense all types of automotive, aviation, diesel, and burner fuels. Only one type of fuel should be carried in and dispensed from the unit at one time. Dispensing with the tank and pump unit may be done in various ways to meet different situations in the field. Even though differences exist between the models, all the tank and pump units operate basically the same.

Preparing for Start of Tank and Pump Units

A number of steps and precautions must be followed before starting the tank and pump unit. These steps are as follows:

- Check the suction hose connections between the tanks and the pumping assembly to ensure that they are properly locked into place.
- Connect the ground wires from the ground reel on the pumping assembly to the grounding rod driven into the ground close to the vehicle being refueled.
- Maintain at least 25 feet between vehicles being refueled.
- Open only the fill port of the vehicle being refueled. Do not refuel two vehicles at one time unless there are two people available to monitor both nozzles constantly.
- Open the hand valves on the filter/separator sight glass assembly, and allow the sight glass to fill. If the glass does not fill, open the petcock on the lower valve to release the air. Close the petcock when the sight glass is full.
- Check the sight glass for the presence of water, and drain when necessary.

NOTE: Some models have a pipe plug drain instead of the petcock on the filter/separator. This pipe plug drain must be removed to drain water.

- Attach the nozzle grounding cable to the vehicle being refueled.

WARNING

Normally the pump will automatically prime itself by gravity flow when the tanks are full. Do not remove the priming cap to check for pump prime. This will result in a fuel spill. Entrapped air will be released through the dispensing nozzle when it is first opened for dispensing.

Starting the Gasoline Engine

Several important steps must be followed to start the gasoline engine. These steps are as follows:

- Open the coupler angle valve assembly by turning the handwheel counterclockwise.
- Move the four-way valve handle to the required position.

- Move the remote pump switch to the ON position.
- Stopping the Engine/Motor. To stop the gasoline engine, close the discharge valves on the tanks and allow the engine to idle for three to five minutes. After the engine has cooled, shut off the ignition switch. To stop the electric motor, turn the remote pump switch to the OFF position.

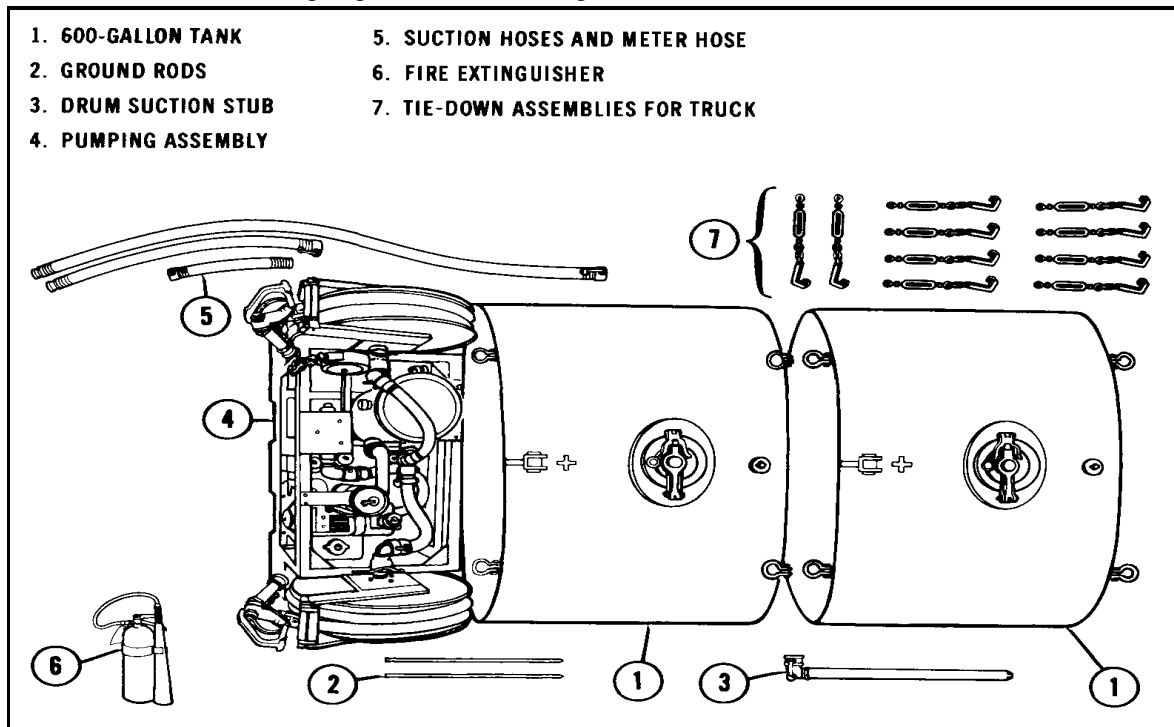


Figure 24-1. Tank and pump unit

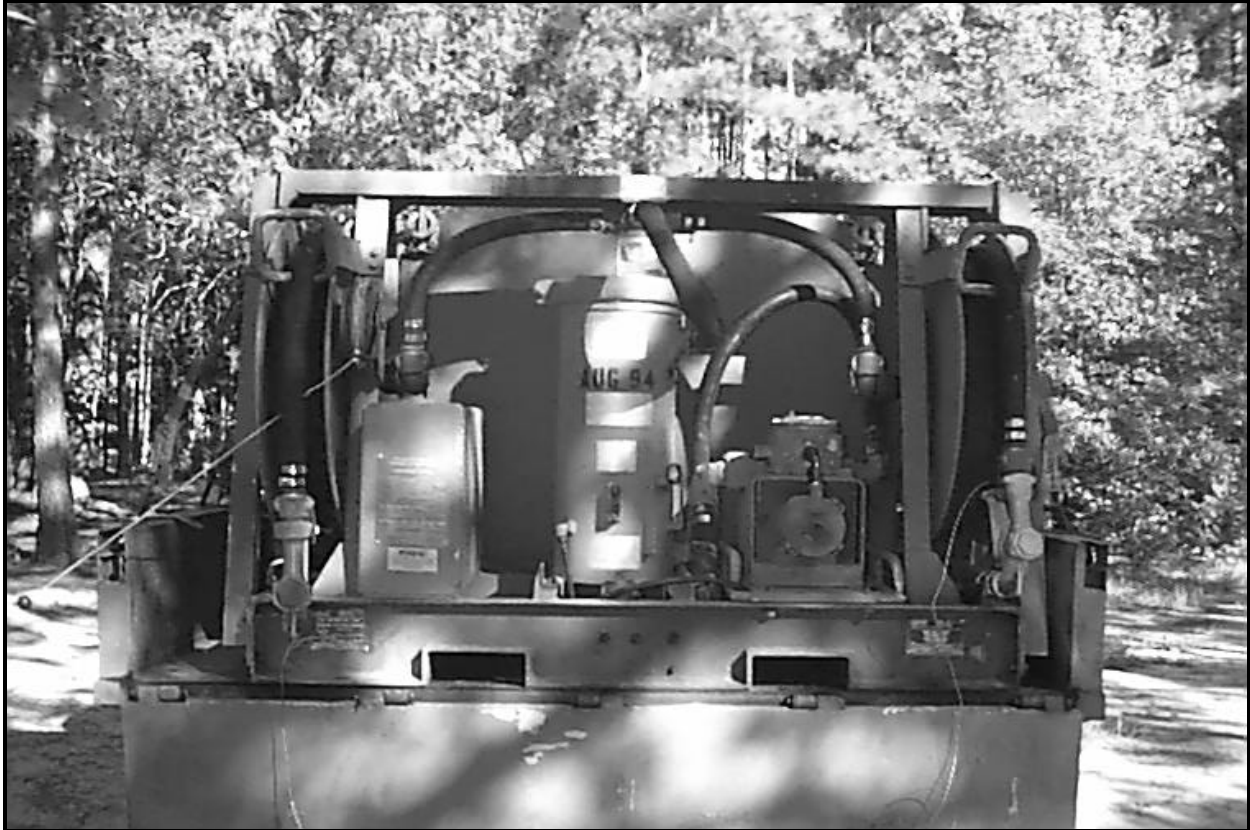


Figure 24-2. Mounted tank and pump unit

1. Bottom Loading Port
2. Dispensing Reel
3. Filter Separator
4. 50 GPM Electrical Pump
5. Quick Dry Disconnect Adapter
6. Tank Control Levers
7. Toolbox
8. Static Discharge Reel

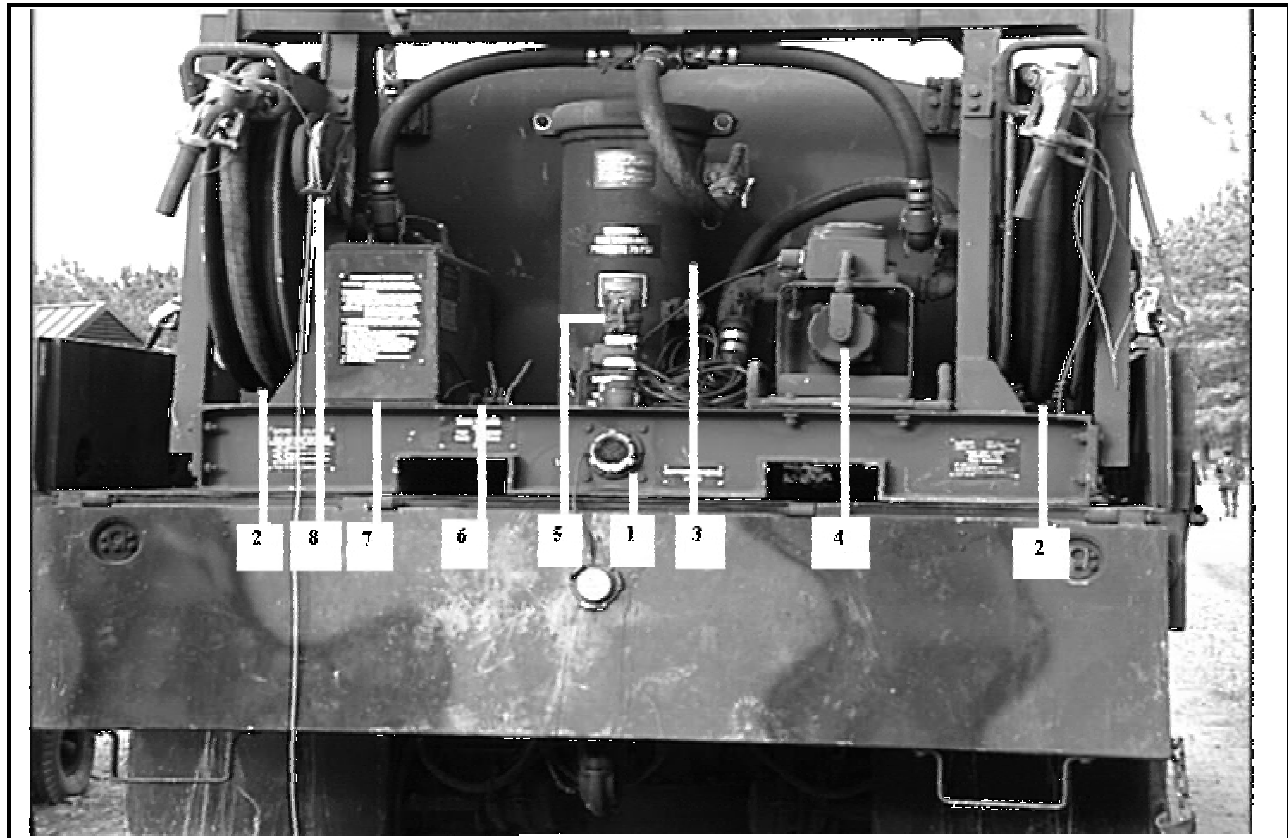


Figure 24-3. New model tank and pump unit

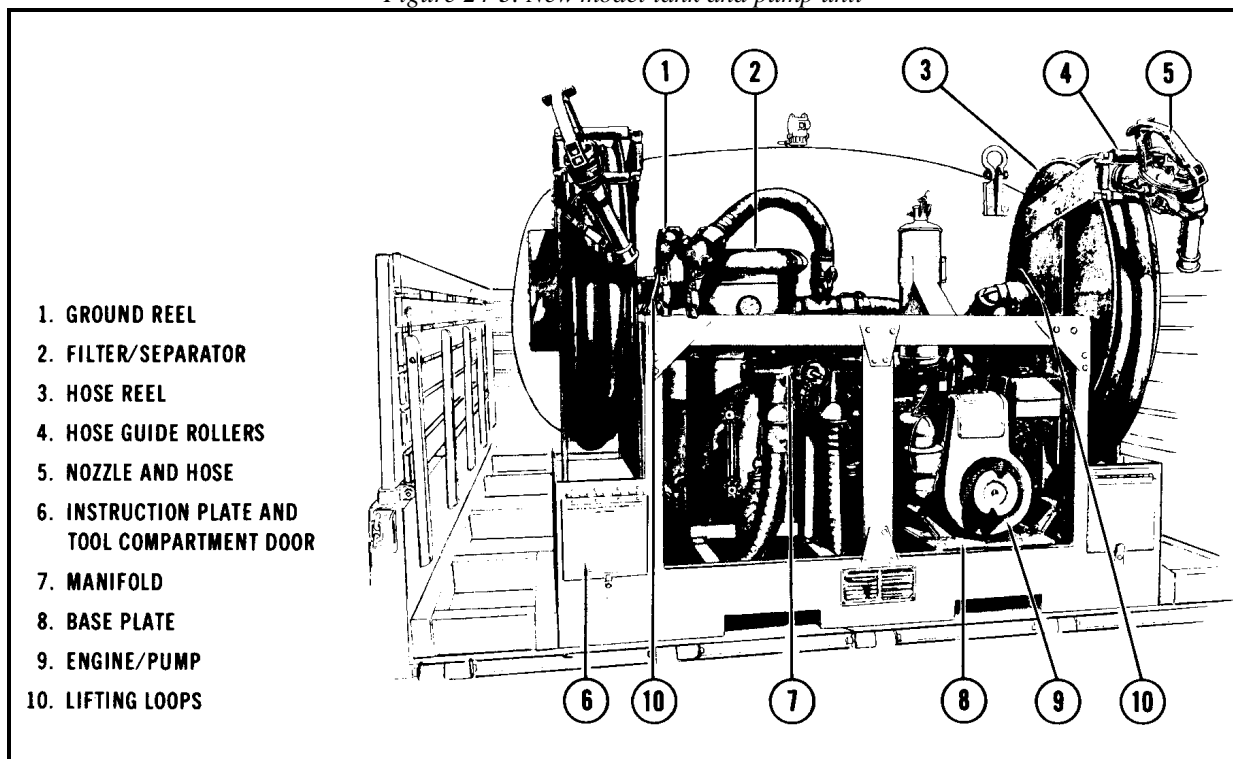


Figure 24-4. Pumping Assembly

Section II. Tank Trucks

M49A2C

The M49A2C tank truck is used mainly for transporting bulk petroleum and for general refueling. Its description and use are discussed in the following paragraphs.

Description

The M49A2C tank truck as shown in Figures 24-5, page 24-7, and Figure 24-6, page 24-7, is mounted on a modified M45A2 chassis. The truck has a multifuel engine and single front and dual rear tires. It is about 23 feet long, 8 feet wide, and 7 2/3 feet high. TM 9-2320-209-34P gives details on this tank truck. The components of the vehicles are discussed below.

NOTE: This FM uses the terms curbside, roadside, left side, and right side. Curbside and roadside refer to the right and left sides, respectively, of a vehicle parked at the curb on the right side of the two-way street. The left side of the vehicle is the driver's side.

- **Tank body and equipment.** The tank body is a stainless steel, 1,200-gallon shell divided into two 600-gallon compartments. Each compartment has a manhole and filler cover assembly as shown in Figure 24-7, page 24-8. There is a walkway on each side of the tank body. A 5-pound carbon dioxide fire extinguisher is mounted on the left rear and the right front of the tank body walkways. An equipment compartment or cabinet is located at the rear of the tank body. This compartment houses the fuel delivery system of the tank truck. The components of this system and their location in the rear compartment are shown in Figure 24-8, page 24-8.

- **Delivery pump.** A rotary, positive-displacement pump, located in the rear equipment compartment (Figure 24-8, page 24-8), pumps fuel from the tank truck. The pump is rated at 80 GPM at 700 RPM. The speed of the pump is governed by a speed control linkage assembly. The throttle control is located on the instrument panel in the operator compartment.

- **Filter/separator.** There is an upright filter/separator in the rear equipment compartment (Figure 24-8, page 24-8) of the M49A2C tank truck. It has three filter elements, three go/no-go fuses, a pressure gage, and an automatic dump valve.

- **Hose and nozzle assembly.** A 35-foot length of 1½-inch reinforced hose with a standard 1½-inch nozzle is mounted on the left side of the tank body.



Figure 24-5. Roadside view M49A2C



Figure 24-6. Curbside view of M49A2C tank



Figure 24-7. Manhole and filler covers of tank compartments on M49A2C tank truck

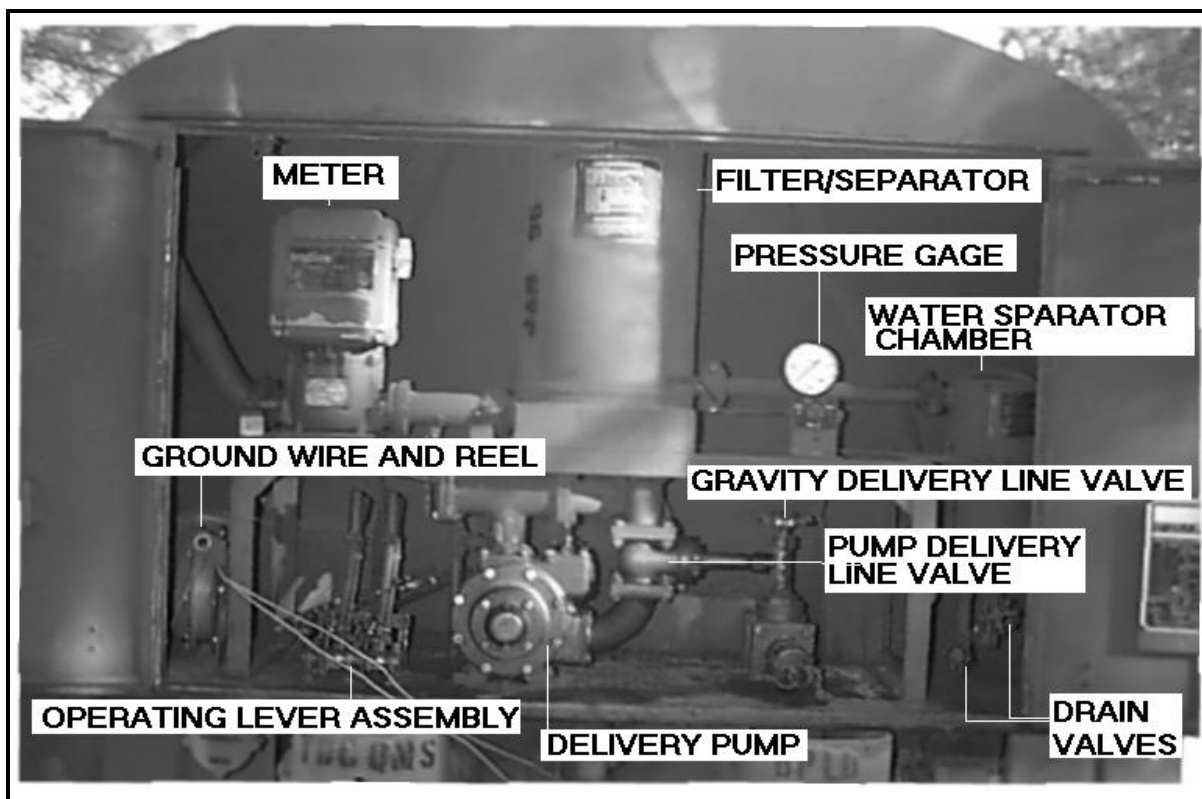


Figure 24-8. Rear equipment compartment of M49A2C tank truck

Use

The M49A2C tank truck can carry bulk petroleum both on and off the road. However, it can carry only 600 gallons when it travels off the road because the forward tank must be left empty. The truck can be used to fill and empty 500-gallon collapsible drums and 55-gallon drums and to refuel ground vehicles. The tank truck is used also in the open port refueling of aircraft. More information on the M49A2C can be obtained in the appropriate TM. Appendix K covers various conversion procedures that must be followed when changing products in tank cars and tank trucks.

M978 HEMTT

The M978 tank truck is used to haul and dispense bulk petroleum fuels. It is primarily used to refuel vehicles and aircraft.

Description

The M978 tank truck as shown in Figure 24-9 is a 10-ton, 8X8 vehicle. It is on-the-road and off-the-road, all weather and all-terrain vehicle. The truck has an eight-cylinder, two-cycle, turbocharged, liquid-cooled, diesel engine. It can haul and dispense 2,500 gallons of bulk petroleum. The tank truck can ford water up to 48 inches deep. It is about 8½ feet tall and about 33 1/3 feet long. It has a highway cruising range of 300 miles. The components of the vehicle are discussed below.

- Tank body and equipment. The tank is a stainless steel, 2,500-gallon, single compartment shell with one manhole cover. A cabinet at the rear of the vehicle houses the vehicle's fuel delivery manifold system, hose reels, ground cables, a deadman shutoff, and a filter/separator.

- **Delivery pump.** Fuel is pumped from and into the vehicle by a 300-GPM centrifugal pump. The pump is driven by a power takeoff from the vehicle's engine. The vehicle also has an alternate fuel delivery pump. This 25-GPM pump is powered by 24 volts DC from the vehicle electric system.
- **Filter/separator.** The filter/separator is located in the cabinet at the rear of the M978 tank truck. It is a 300-GPM unit with a pressure differential indicator, 15 filter and canister assemblies, and a manual drain valve. There is a sampling probe on the discharge side of the filter/separator for use with the Aqua-Glo water test kit.
- **Discharge and suction hoses.** The tank truck has two hose reels in the cabinet at the rear of the vehicle. Each hose reel has 50 feet of 1½-inch dispensing hose. Each hose has a 50-GPM capacity. The hose ends have male cam-locking couplings and bonding connections. Each hose reel has a fuel-servicing nozzle. The HEMTT also has a 15-foot section of 3-inch suction hose.



Figure 24-9. Roadside view of M978-tank truck

Use

The truck can travel on all types of terrain with a full payload. It is able to transport bulk fuels in areas where other tank trucks cannot operate. The tank truck can service two vehicles at one time. Because it is equipped with a filter/separator, it may also be used to refuel aircraft.

Section III. Tank Semitrailers

M131A5C

The M131A5C tank semitrailer is used to carry and transfer fuel, service containers, and refuel ground vehicles. Its description and use are explained in the following paragraphs.

Description

This vehicle as shown in Figures 24-10, page 24-11 and 24-11, page 24-11 is a 12-ton, four-wheel, 5,000-gallon tank semitrailer. It is normally towed by a 5-ton, 6X6 tractor truck that has a fifth wheel. The semitrailer is about 31 feet long, 8 feet wide, and 9 feet high. TM 9-2330-272-14&P has details on this tank semitrailer. The components of the vehicles are discussed below.

- **Tank body and equipment.** The tank body of the M131A5C is made of stainless steel. It is divided into two 2,500-gallon compartments. Each compartment has a 20-inch manhole cover and a filler cover with a vent valve as shown as Figure 24-12, page 24-11. The top of the tank body has a steel grate so that personnel do not slip when they walk on the walkway. The walkway, reached by a ladder at the rear of the vehicle, gives access to the

manhole covers. An equipment cabinet is mounted on each side of the tank vehicle. These cabinets hold the semitrailer discharge and loading system. The components of this system located in the roadside equipment cabinet are shown in Figure 24-13, page 24-12. Figure 24-14, page 24-13, shows the system components located in the curbside equipment cabinet. A hose compartment is mounted on the tank body above the roadside equipment cabinet as shown in Figure 24-10, page 24-11. The hose compartment is horizontally divided into three tubes which house three 15-foot lengths of suction hose and gage stick.

- **Auxiliary engine and pump assembly.** The auxiliary engine and pump assembly is located in the curbside cabinet as shown in Figure 24-14, page 24-13. It is used to pump product into or out of the compartments. The assembly has a two-cylinder, four-cycle, horizontally opposed, air-cooled engine and a self-priming, 225-GPM centrifugal pump. The pump is connected directly to the engine through a shaft mounted on a bearing. The engine and pump are separated by a fire wall.

- **Filter/separator.** A filter/separator is mounted on the right side of the tank body on the M131A5C tank semitrailer. It has 15 elements and 5 canisters. The unit also has 15 go/no-go fuses mounted in the canister elements. The filter/seperator's operating pressure is 75 PSI. Its capacity is 300 GPM.

- **Dispensing hose and reels.** The M131A5C tank semitrailer has 2½-inch and 1½-inch dispensing hose reels. Both reels are stored in the roadside equipment cabinet. The 2½-inch dispensing hose reel holds a 50-foot section of 2½-inch dispensing hose. This hose has a 2½-inch nozzle. Its discharge capacity is 225 GPM. The 1½-inch dispensing hose reel holds a 50-foot section of 1½-inch dispensing hose. This hose has a 1½-inch nozzle and is used for low-rate discharge (0 to 55 GPM).



Figure 24-10. Curbside view M131A5C

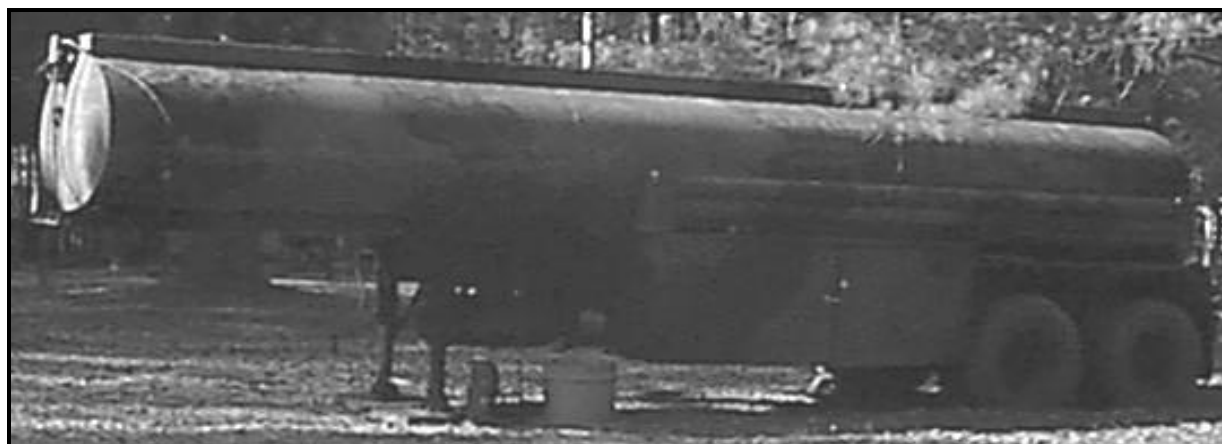


Figure 24-11. Roadside front view M131A5C tank semitrailer



Figure 24-12. Manhole and filler covers and walkway of the M131A5C and M131A5 tank

- | | |
|---|---|
| 1. 1 ½ -INCH NOZZLE | 13. PUMP INTAKE VALVE |
| 2. 1 ½ -INCH HOSE ON REEL
(0 TO 55-GPM DISPENSING) | 14. PUMP CUTOFF VALVE HANDWHEEL |
| 3. HOSE REEL HANDCRANK
ATTACHED TO SHAFT | 15. REAR COMPARTMENT MANIFOLD VALVE
HANDWHEEL |
| 4. FIRE SYSTEM NOZZLE | 16. HOSE REEL HANDCRANK CLAMPS |
| 5. CONTROL AND INSTRUMENT
PANELS | 17. GRAVITY DISCHARGE VALVE |
| 6. RATE-OF-FLOWSELECTOR
VALVE | 18. 3-WAY VALVE LEVER |
| 7. METER | 19. FRONT COMPARTMENT MANIFOLD
VALVE HANDWHEEL |
| 8. 225-GPM CUTOFF VALVE
HANDWHEEL | 20. PUMP DISCHARGE VALVE |
| 9. FIRE SYSTEM NOZZLE | 21. STATIC REEL |
| 10. 2 ½ INCH HOSE ON REEL
(225-GPM DISPENSING) | 22. EMERGENCY DUMP VALVE OPERATING
LEVERS |
| 11. 2 ½ -INCH NOZZLE | |
| 12. HOSE REEL CRANKSHAFT | |

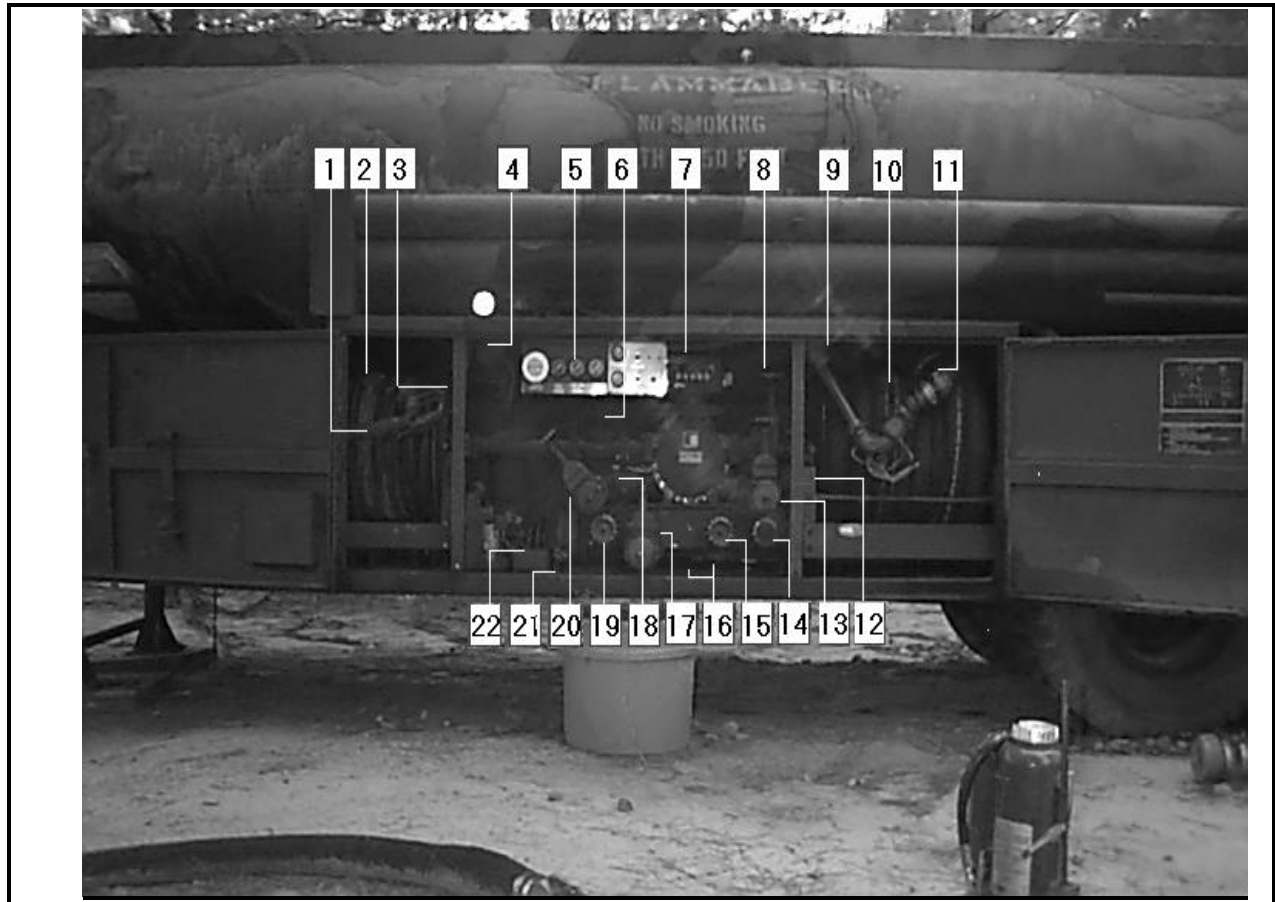


Figure 24-13. Roadside equipment cabinet of the M131A5C tank semitrailer

1. EXHAUST
2. FIXED FIRE EXTINGUISHER NOZZLE
3. CENTRIFUGAL PUMP
4. PUMP DISCHARGE LINE
5. PUMP SUCTION LINE
6. FUEL TANK AND SEDIMENT BOWL
7. BATTERY
8. BATTERY LEAD
9. FIRE WALL PANELS
10. ENGINE
11. SPARK PLUG CABLE
12. BREATHER
13. BREATHER
14. BREATHER
15. BREATHER
16. BREATHER
17. BREATHER
18. BREATHER
19. BREATHER
20. BREATHER
21. BREATHER
22. BREATHER

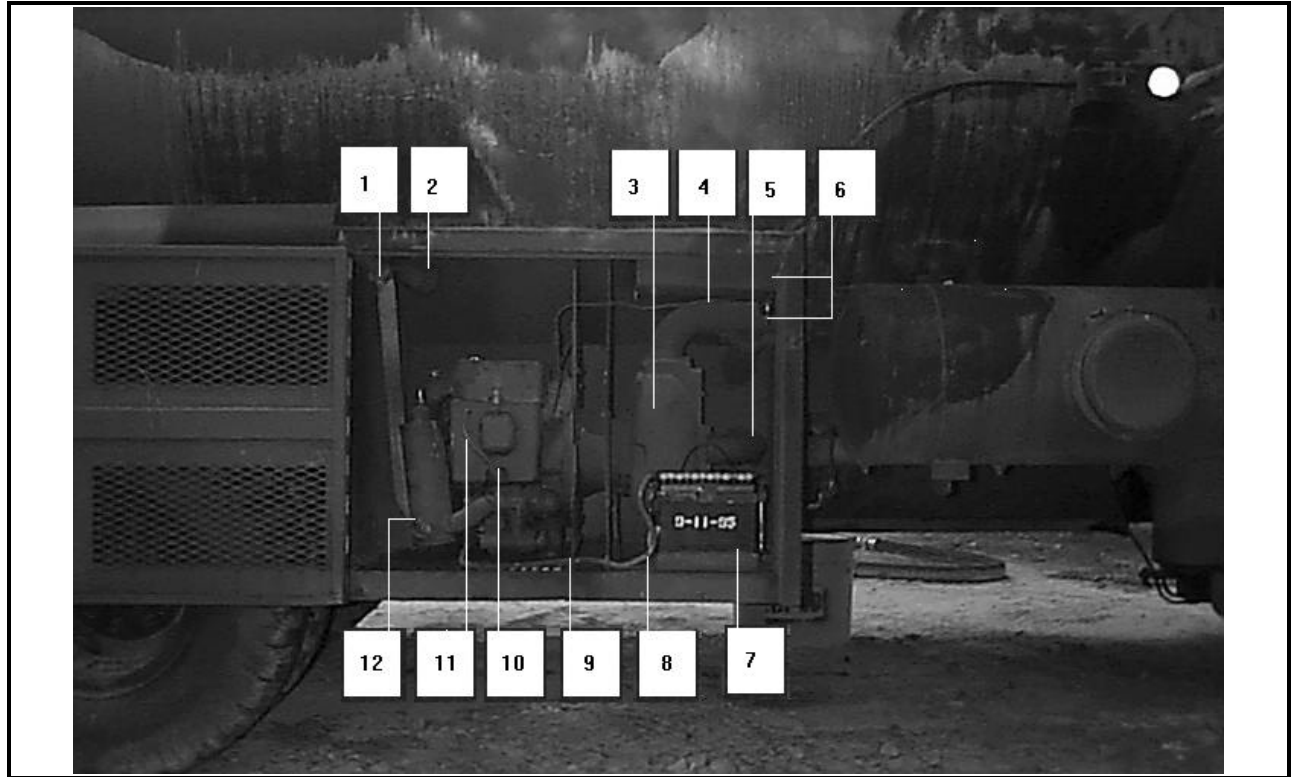


Figure 24-14. Curbside equipment cabinet of the M131A5C tank semitrailer

Use

The semitrailer can travel cross-country with a reduced payload of 3,300 gallons (1,650 gallons in each tank compartment). It can fill or empty 3,000-, 10,000-, and 50,000-gallon collapsible tanks. The vehicle can transfer product to or receive it from the FSSP. Also, the semitrailer can be used in the open-port refueling of aircraft that can take on fuel at rates of 225 GPM. Chapter 16 has more information on the M131A5C tank semitrailer and aircraft refueling.

M967

The M967 tank semitrailer as shown in Figures 24-15, page 24-14, and 24-16, page 24-14, is a bulk hauler with a self-load and self-unload capability. It is designed for general highway and limited cross-country use. It has a 5,000-gallon- capacity tank. The semitrailer can be transported by a C-130 aircraft. It is designed to be towed by a 5-ton, 6x6 tractor truck or by a similar vehicle equipped with a fifth wheel. The M967A1 version of this semitrailer is equipped with a hose trough cover, front and rear drains, and a tachometer and lead assembly. Detailed information on the semitrailer is found in TM 9-2330-356-12&P.

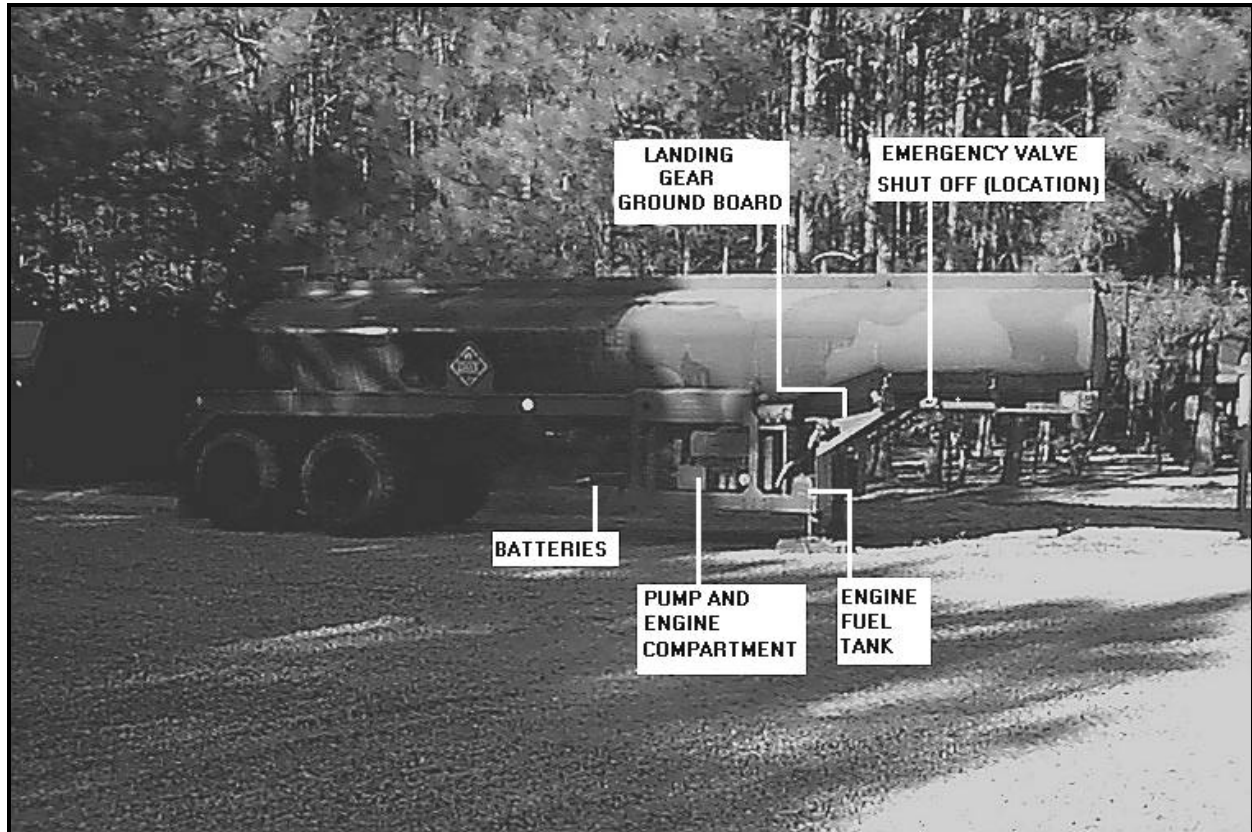


Figure 24-15. Curbside view M967 tank semitrailer

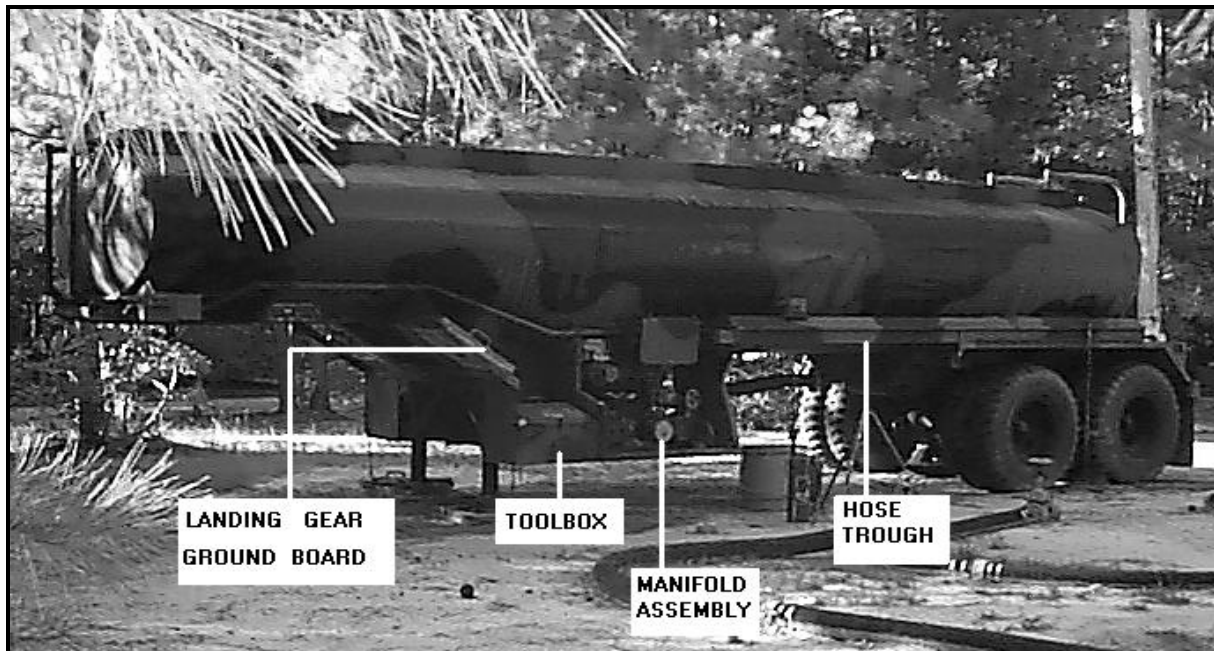


Figure 24-16. Roadside view M967 tank semitrailer

Description

The stainless steel body of the M967 consists of one 5,000-gallon fuel compartment. The compartment contains pressure and vacuum vents and a manhole with locking device. The fuel delivery system is mounted on the sides of the vehicle. On the curbside of the vehicle are a pump and engine compartment, a pump engine fuel tank, a landing gear crank, a hose trough, and an emergency shutoff valve. On the roadside of the vehicle are a hose trough, a ground board, a toolbox, a piping assembly, a control panel, and a portable grounding rod.

Use

The M967 semitrailer is used for bulk delivery of fuel. It does not have the dispensing capability of the M969 or the M970. The four-cylinder, four-cycle auxiliary engine and pumping system can deliver bulk fuel at a rate of up to 600 GPM and can self-load at a rate of up to 300 GPM.

M969

The M969 as shown in Figures 24-17 and 24-18, page 24-16, is a fuel-dispensing semitrailer. It has the same bulk delivery and self-load capabilities as the M967. It also has a 5,000-gallon-capacity tank and can be towed and transported in the same way as the M967 tank semitrailer.

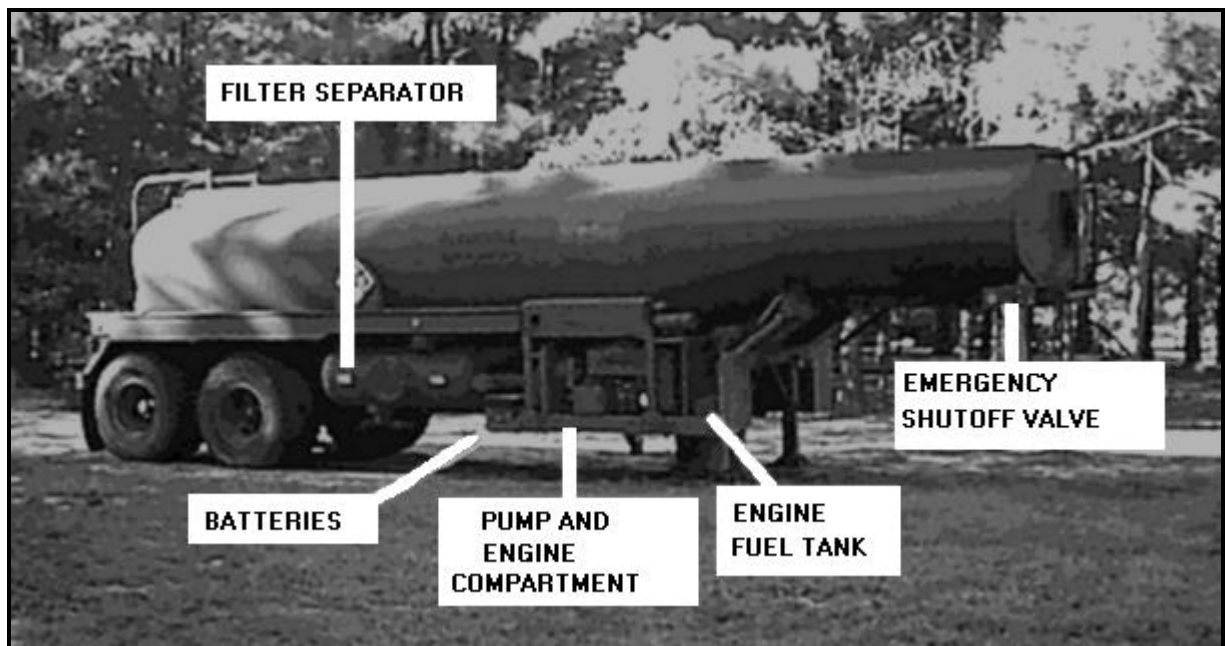


Figure 24-17. Curbside front view of M969 tank semitrailer

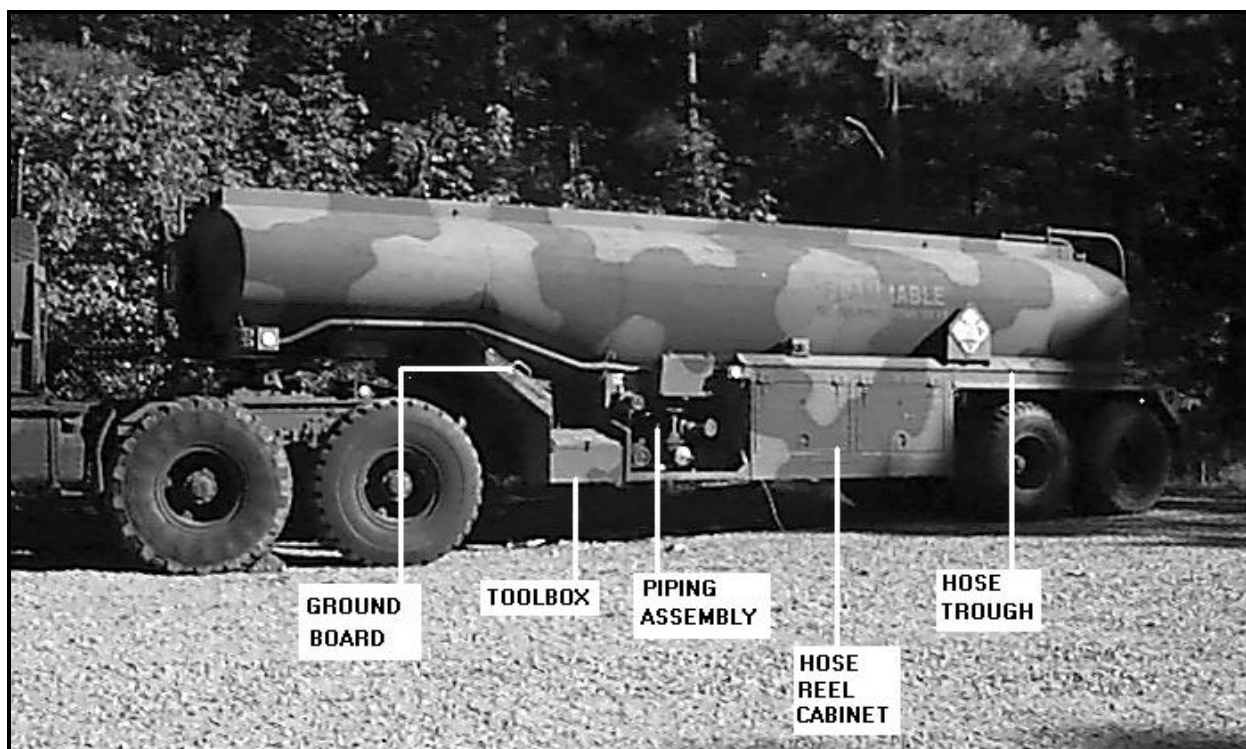


Figure 24-18. Roadside view of M969 tank semitrailer

Description

The tank body and the auxiliary engine and pump assembly are identical to those of the M967. The M969A1 version of this semitrailer is equipped with a hose trough cover, a control panel cover, a rear ladder, front and rear drains, and a tachometer and lead assembly. Additional differences found on the M969A1 model are an elastomeric-type drive coupling between the fuel-dispensing pump and the engine assembly, a new axle, bogie, and braking system. The vehicle components are discussed below.

- **Tank body and equipment.** The M969 has the same equipment that is included with the M967. It also has the equipment needed for automotive refueling and limited aircraft refueling. This equipment is mounted on the sides of the vehicle. The filter/separator, the pump and engine assembly as shown in Figure 24-19, page 24-17, the engine's fuel tank, the landing gear crank, the emergency shutoff valve, a hose trough, and the battery compartment for two batteries are located on the curbside of the M969. A hose trough, a portable grounding rod, a control panel, the manifold valving, and a hose reel cabinet as shown in Figure 24-20, page 24-18, are on the roadside of the vehicle.

- **Filter/separator.** The filter/separator is rated at 300 GPM and 15 PSI. It has three filtering stages. In the first stage, 15 filter elements remove solid particles and coalesce any water in the fuel. In the second stage, five canisters separate the water from the fuel and let it drain into the filter/separator sump. Finally, 15 go/no-go fuses act as safety devices to shut off the flow of fuel if the other two stages allow water to exceed a safe level. Three of these fuses are in each of the second-stage elements. Other parts of the filter/separator include an automatic drain valve, a manual drain valve, and a pressure gage. When water in the filter sump reaches a certain level, the water is removed by the automatic drain valve. This valve is operated by a float which rises in water and sinks in fuel. As water enters the filter sump, the float rises. When the float rises to a certain level, a valve opens in the drain valve assembly allowing pump pressure to be applied to a diaphragm valve. The opening of the diaphragm valve causes the automatic drain valve to open, allowing the water to drain. As the water is being drained, fuel flow is continued. If water enters the sump faster than the automatic drain valve can carry it away or if the filter elements fail, the go/no-go fuses stop the flow of fuel. The pressure gage is located on the instrument panel in the roadside equipment cabinet. It shows the amount of restriction in the filter/separator.

- Meters. Two 100-GPM meters are located in the roadside cabinet of the M969 tank semitrailer. To reset a meter to zero, the operator must push in and turn clockwise the meter reset knob on the side of the meter. The meters may be used to measure fuel during fueling or defueling operations.
- Dispensing hose assemblies. The M969 tank semitrailer has three dispensing hose assemblies. Three 14-foot sections of 4-inch suction hose are stored in troughs on the sides of the vehicle. This assembly has a bulk delivery rate of up to 600 GPM and a self-load rate of 300 GPM. The other two hose assemblies are located in the hose reel compartment. Each of these assemblies has a meter, a hose reel with electric rewind, 50 feet of 1 1/4-inch hose, and a dispensing nozzle.

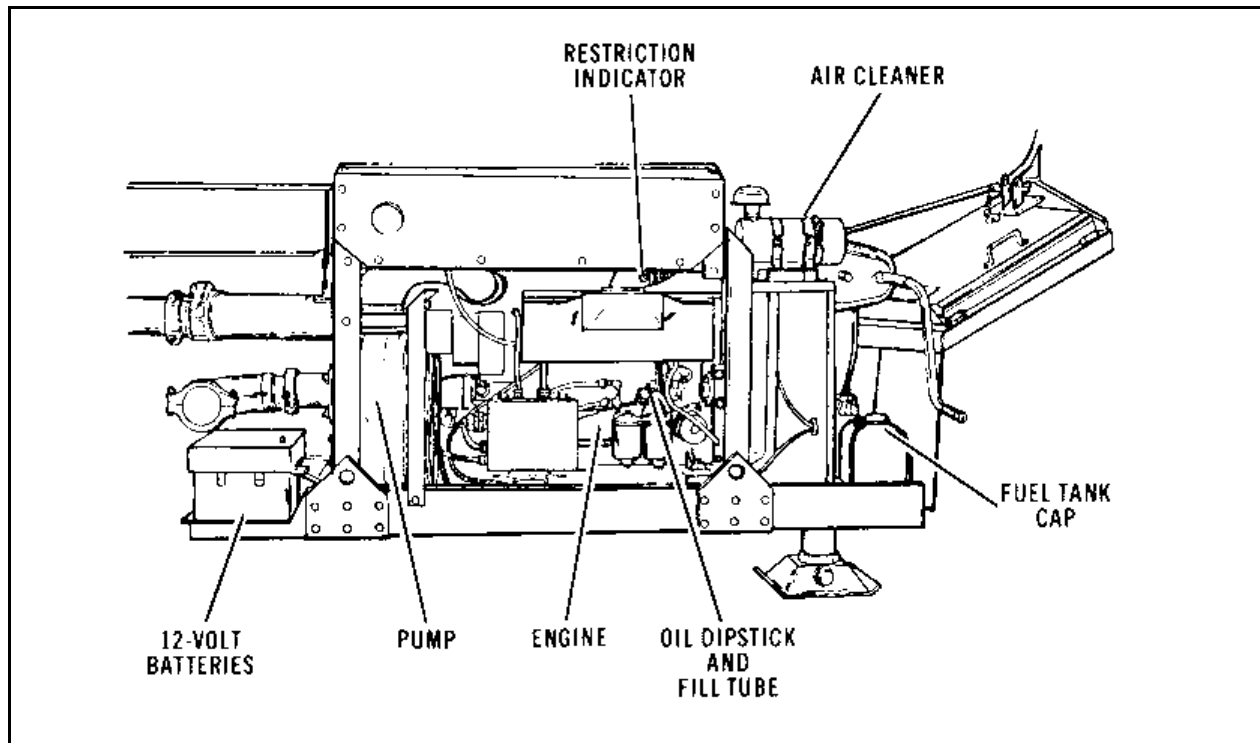


Figure 24-19. Pump and engine assembly of M969 tank semitrailer

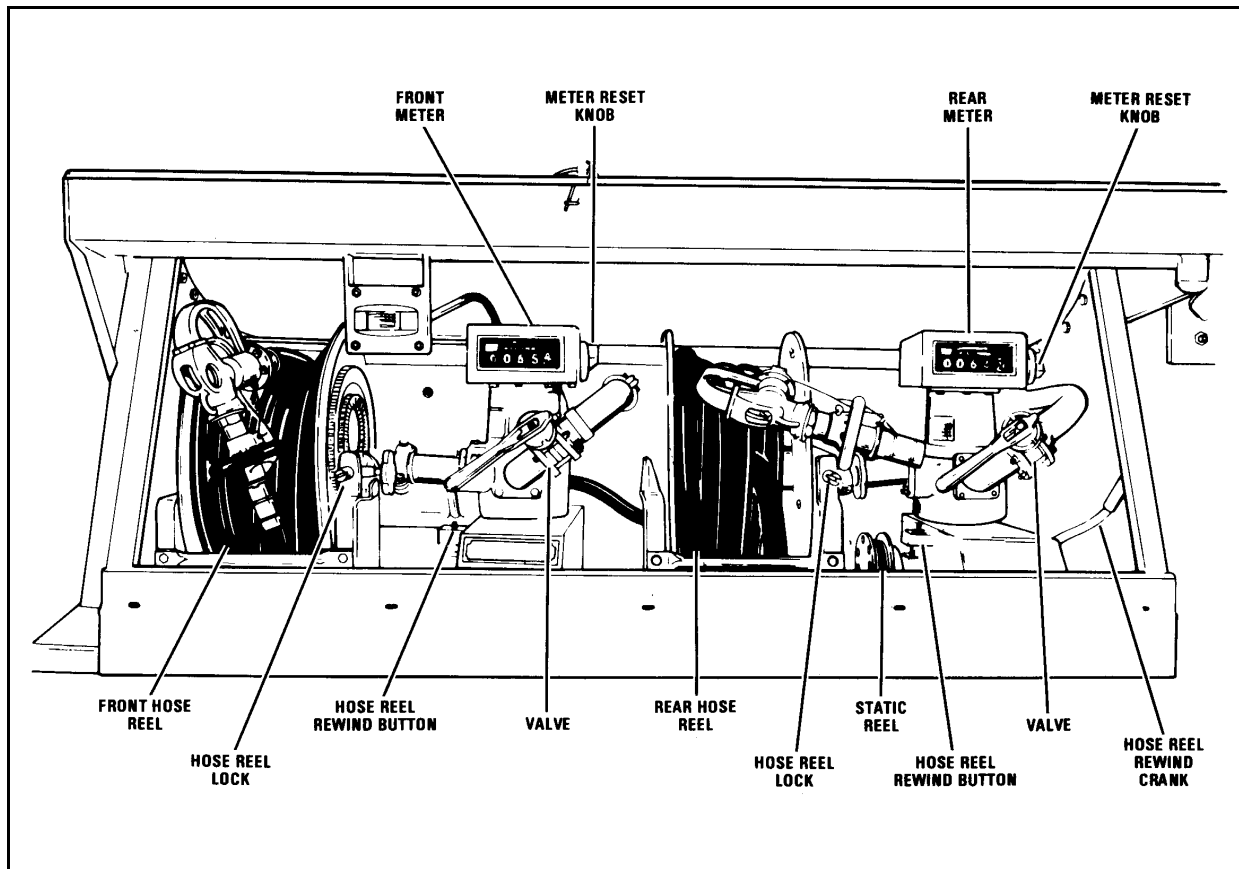


Figure 24-20. Hose reel cabinet of M969 tank semitrailer

Use

The M969 tank semitrailer is used primarily for bulk fuel delivery. It may also be used for limited aircraft re-fueling. See Chapter 16 for more information.

M970

The M970 as shown in Figures 24-21, page 24-19, and 24-22 page 24-19, is specifically designed to refuel aircraft. Its description and use are discussed below.

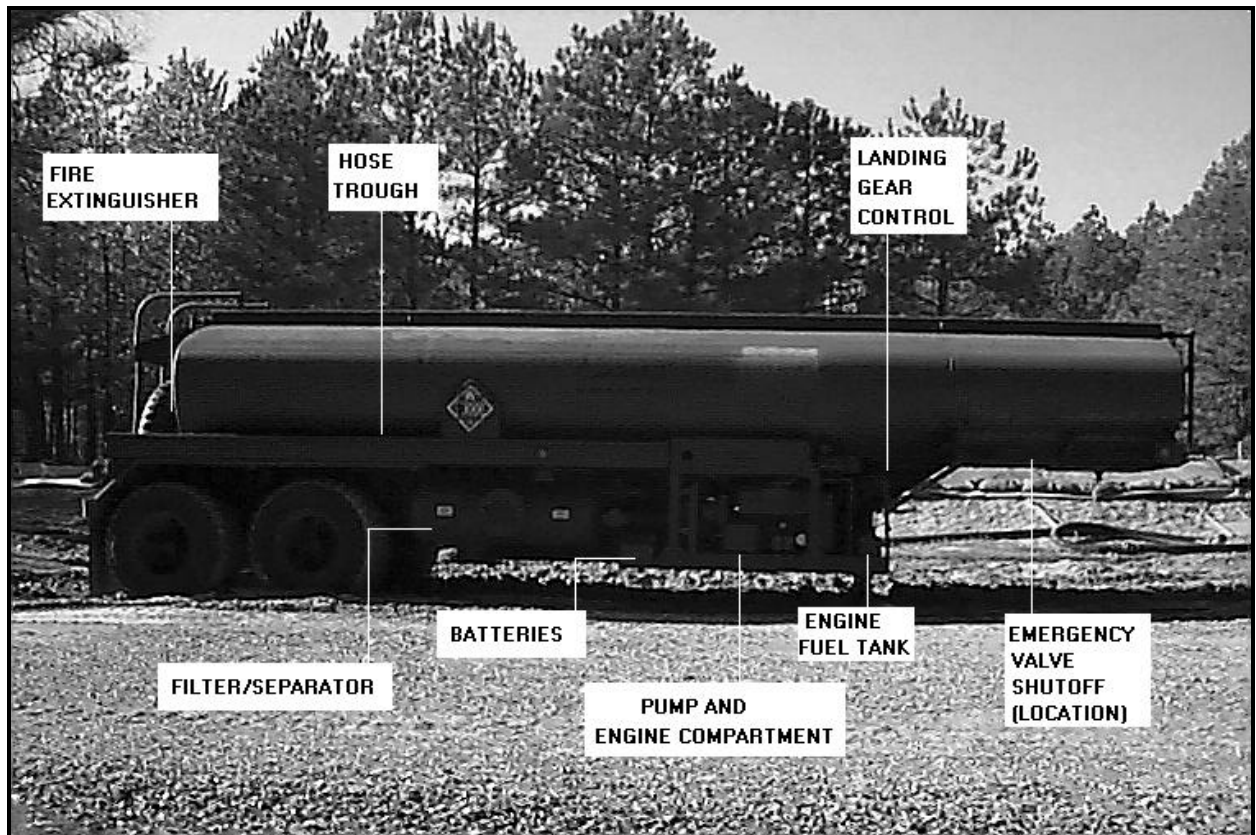


Figure 24-21. Curbside view M970- tank semitrailer

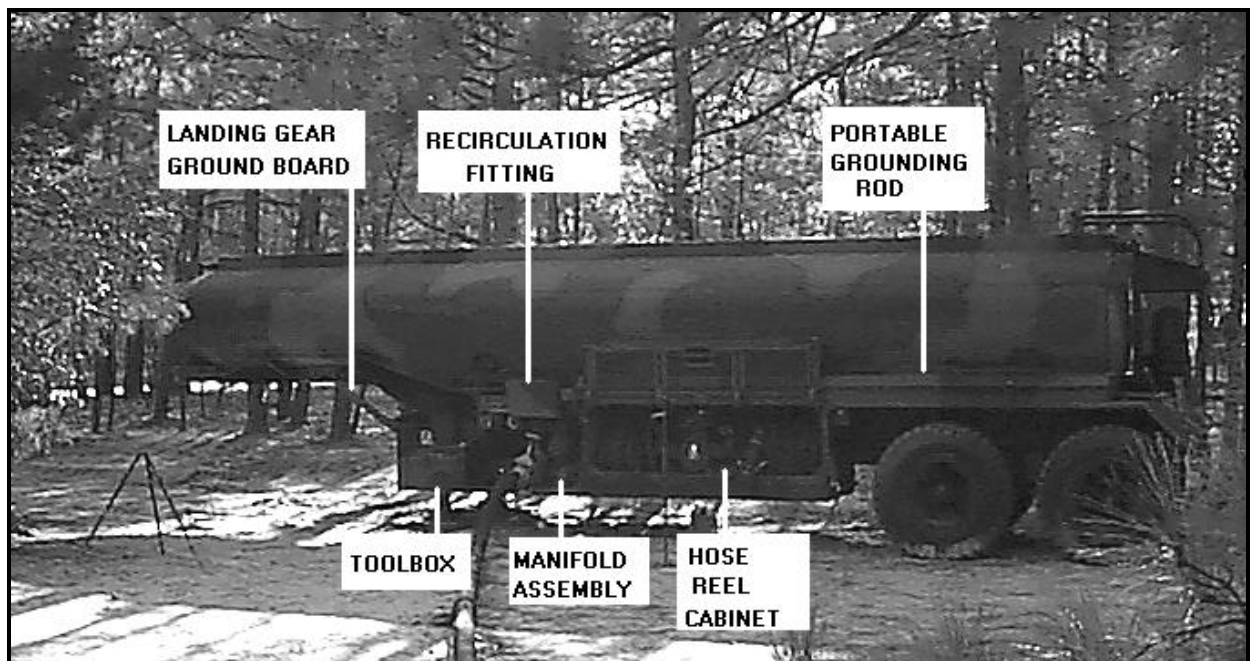


Figure 24-22. Roadside view M970 tank semitrailer

Description

The M970 tank semitrailer has a 300-GPM bulk delivery capability and a self-load capability. It has the same 5,000-gallon capacity as the M967 and M969. It can be towed and transported in the same way as the M967 and M969 semitrailers. The M970 has a 3-inch, high-pressure centrifugal pump and a recirculation system. The M970A1 version of this semitrailer is equipped with a hose trough cover, a control panel cover, a rear ladder, a front and rear drain, and a tachometer and lead assembly.

- **Tank body and equipment.** In addition to the equipment on the M967, the M970 has special-purpose equipment required for overwing and underwing aircraft refueling. This equipment is mounted on the sides of the vehicle. A filter/separator, a pump and engine compartment, the engine's fuel tank, a landing gear crank, an emergency shutoff valve, a hose trough, and a battery compartment for two batteries are on the curbside of the vehicle. A hose trough, a portable grounding rod, a ground board, a toolbox, a piping assembly, a control panel, the manifold valving, and a hose reel cabinet as shown in Figure 24-23, page 24-21, are on the roadside of the vehicle.

- **Filter/separator.** The M970 has the same filter/separator as the M969. It has a pressure differential gage that is mounted on the control panel of the roadside equipment panel.

- **Meter.** The M970 tank semitrailer has one 300-GPM, full-metering meter located in the hose reel cabinet. The meter serves all three dispensing assemblies.

- **Dispensing hose assemblies.** There are three dispensing hose assemblies on the M970 tank semitrailer. One is made up of three 14-foot sections of 4-inch suction hose stored in hose troughs on the vehicle. The other two assemblies are located in the roadside equipment cabinet. One assembly is for underwing refueling. It includes 50 feet of 2½-inch hose with an electric rewind reel, a deadman control, and a D-1 nozzle. The overwing refueling assembly has 50 feet of 1½-inch hose, an overwing dispensing nozzle, and a hose reel with electric rewind.

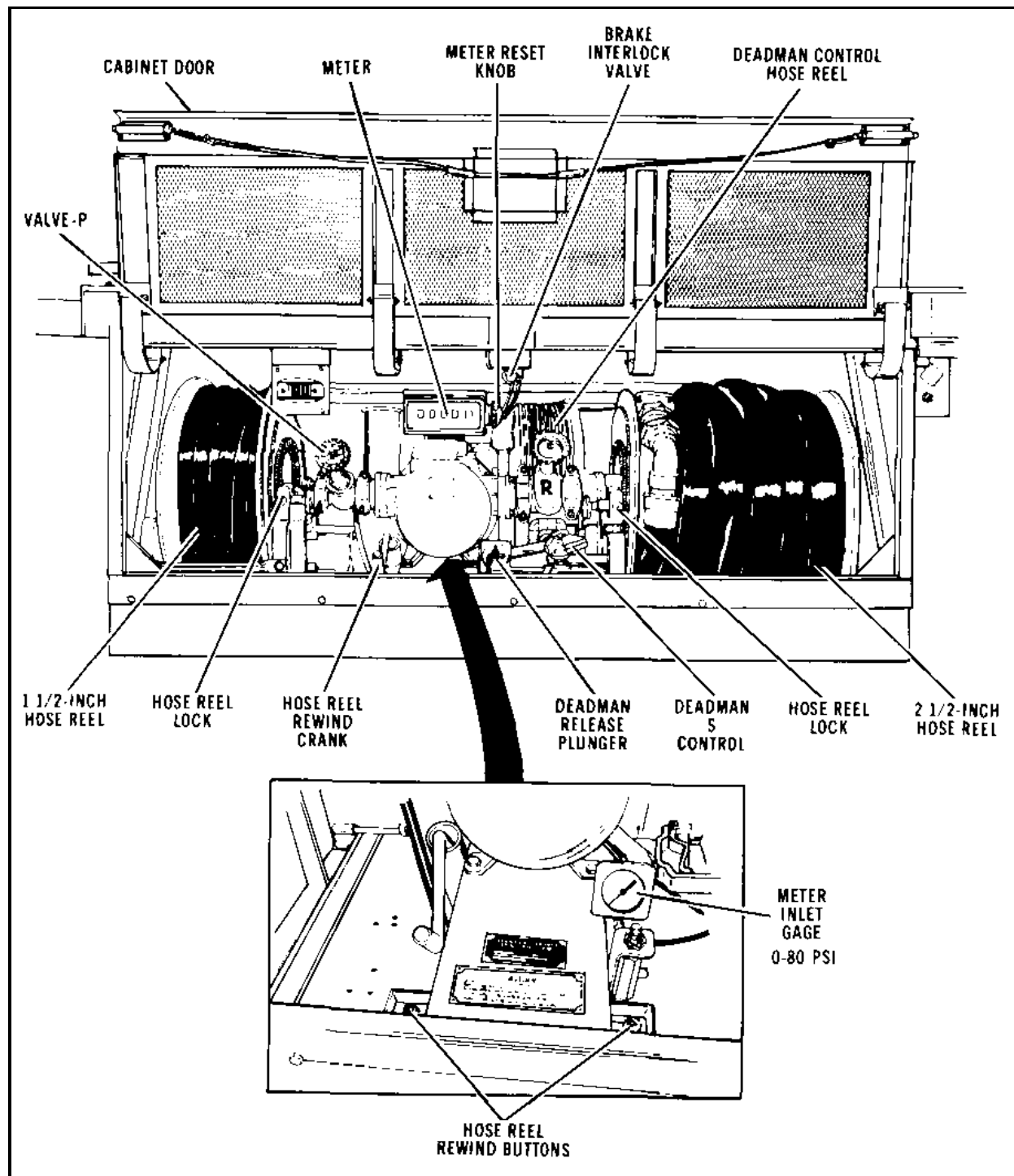


Figure 24-23. Hose reel cabinet of M970 tank semitrailer

Use

The M970 is used chiefly for underwing and overwing aircraft refueling. The recirculation system facilitates fuel sampling and allows for complete recirculation of fuel to remove condensation and contamination.

M1062

The M1062 as shown in Figures 24-24 and 24-25, page 24-22, is a bulk fuel semitrailer designed and used to receive transport and discharge bulk fuel on improved roads. Its description and use are discussed below.



Figure 24-24. Curbside view M1062 semitrailer



Figure 24-25. Roadside view M1062 tank semitrailer

Description

The M1062 has a loading capability of 300 GPM using an external pump. It has a single compartment with a capacity of 7,500 gallons plus 3 percent expansion space and weighs 11, 566 pounds empty and about 65,556 pounds full. Full weight will vary depending on product being hauled. The entire vehicle is about 34 foot long, 8 feet wide, and 8 feet 9 inches high. It is designed to be towed by the M915/915A1 tractor equipped with a fifth wheel.

- **Tank Body and Equipment.** The stainless steel tank body of the M1062 tank semitrailer is constructed as one 7,500-gallon compartment with seven baffles. The fuel-handling equipment includes all the necessary piping, fitting, hose, and valves for handling the fuel from the curbside. Forward of the rear wheel is the spare tire carrier, landing gear, hose trough, and upper fifth wheel plate at the front

Use

The M1062 is a bulk fuel line hauler and can be loaded with an external 300 GPM pump. The semitrailer has no on-board filter/separator or pump for retail issues.

VAPOR RECOVERY KIT.

The vapor recovery system as shown in Figure 24-26, page 24-24, can be installed on all models of tank semitrailers and is required in certain ecological areas. The system allows a fuel depot to collect or recover the vapors and gases that are present during the loading operation. Vapors can also be recycled back to the semitrailer through the recovery system during loading operations. The system consists of a vaportight line running from the sealed hood on the emergency valve vent (directly behind the manhole cover) to the rear of the tank. The rollover rail on the roadside of the semitrailer is used as part of the line. The adapter on the end of the line is compatible with the 4-inch quick disconnect vapor recovery connections at a majority of fuel depots.

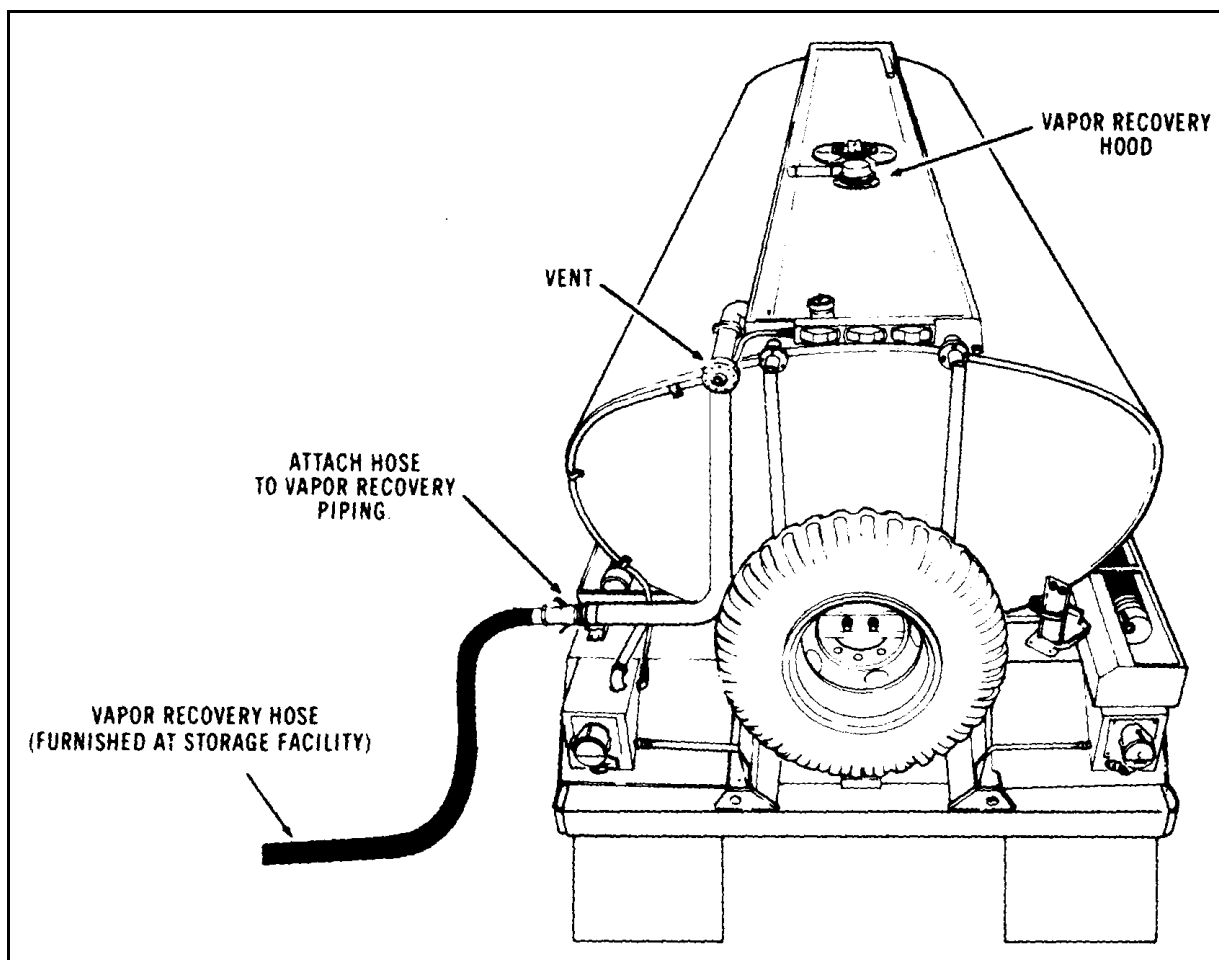


Figure 24-26. Typical vapor recovery system

Section IV. Other Considerations of Tank Vehicles

REFUELER MARKINGS

Specific markings are required on all vehicles transporting hazardous material. Vehicles that carry bulk fuels must be marked on both sides and the back of the tank body with the words **FLAMMABLE** and **NO SMOKING WITHIN 50 FEET**. The word **FLAMMABLE** must be printed in block letters 6 inches high. The words **NO SMOKING WITHIN 50 FEET** must be printed in block letters and numbers 3 inches high. They must be placed directly under **FLAMMABLE** or to the right of it on the same line. On vehicles used in combat, these markings are the same color as the registration markings, usually black on olive drab. On vehicles used on public highways in CONUS, the markings are in red letters on a white background. The capacity of each bulk tank must be marked (NUMBER) GALS below and to the right of each tank manhole cover. Refuelers must be marked, on each side of the tank, with the military symbol for the type of fuel the tank contains. The markings should be 6 inches high for semitrailers, 4 inches high for trucks, and 3 inches high for two-wheel trailers. Refuelers must be placarded IAW AR 55-355 and applicable DOT regulations.

CAMOUFLAGE

Concealing tank vehicles is important in a theater of operations because of their tactical importance. Destroying petroleum supplies and its transportation can effectively cripple a modern, highly mobile force and ground its aircraft. Dispersion is important because of the possibility of one explosion causing other explosions. FM 20-3 and TM 5-200 provide detailed camouflage instructions. Nearby engineer units should be asked for advice and help in planning local camouflage measures; however, each unit is responsible for camouflaging the vehicles it uses.

factors described below can reveal the locations of tank vehicles. Preventive measures are also given.

Tracks

Any vehicle leaves tracks when off a paved surface. Vehicle tracks show up very clearly to aerial observers, especially in dew or snow. The best way to conceal tracks is to make them where they cannot be seen from the air. For example, turn off the road into a wooded area. If the refuelers must be driven in the open, drive parallel to hedges, fences, cultivated fields, or other terrain features that make the tracks less conspicuous. Tracks should be continued past the refueling point (to the next road or to a farm) to give the appearance that they logically go somewhere other than to the refueling area.

Shine

Shine is a giveaway to an unnatural object in a landscape. The windshield, headlights, and cab windows of a tank vehicle are most likely to shine in sunlight, moonlight, or the light of flares. Shine is hard to counteract because light can be reflected through even the smallest gaps in cover. Dark cloth is an ideal cover. In the field, foliage or foliage attached to camouflage nets is usually all that is available. Camouflage paint should be used to dull the body of the vehicle and any shiny part of the fittings or hose couplings.

Shadow

Fender shadows and the dark shadow under a vehicle reveal its presence. Each vehicle also casts a characteristic shadow pattern that can reveal its type. The best way to conceal the shadow is to use natural shadows. A large natural shadow is usually dark enough to hide a refueler parked within it. A refueling vehicle cannot safely be parked within a shadow of a large building, so tree shadows are the only shadows likely to be large enough to conceal it. If a refueler must be parked in the open, it should be parked where its shadow will fall on an irregular surface such as onto brush or into woods. Then the irregular surface will distort the characteristic shape of the vehicle shadow. Camouflage paint can also help conceal shadows. Dark blotches can break up fender patterns, and light paint interspersed with dark patches near the bottom of the tank vehicle can help break up the straight lines of the undercarriage.

VEHICLE PARK

Several factors are considered when laying out a parking area for vehicles. These are described below.

- Layout. Seven considerations determine the proper layout for a vehicle park. When a vehicle park is laid out properly, it will--
 - Leave enough space between refuelers so that they can be driven out quickly in an emergency.
 - Ground vehicles.
 - Let fire control personnel and equipment get to each refueler.
 - Keep fuel that leaks out of a tank vehicle from draining toward a nearby building.
 - Leave at least 25 feet between each refueler and the nearest building that has windows or doors on the side or sides that face the vehicle park.
 - Keep refuelers out of flight paths.

- Provide side protection, such as revetments, when needed.

Tactical and Other Concerns

In a tactical area, the proper layout of a vehicle park may have to be modified. The tactical situation, physical limitations of the site, and requirements for protection and camouflage must be weighed against the standards for a proper layout. The following are among the concerns that must be weighed in a specific tactical area:

- Fuel supplies and tank vehicles may need to be guarded.
- Tank vehicles may have to be shielded from enemy fire.
- Vehicle park may have to be camouflaged.
- Paved areas or hardstands may be limited.